April 13, 1943. J. H. WILSON 2,316,304

MAST POLE DERRICK

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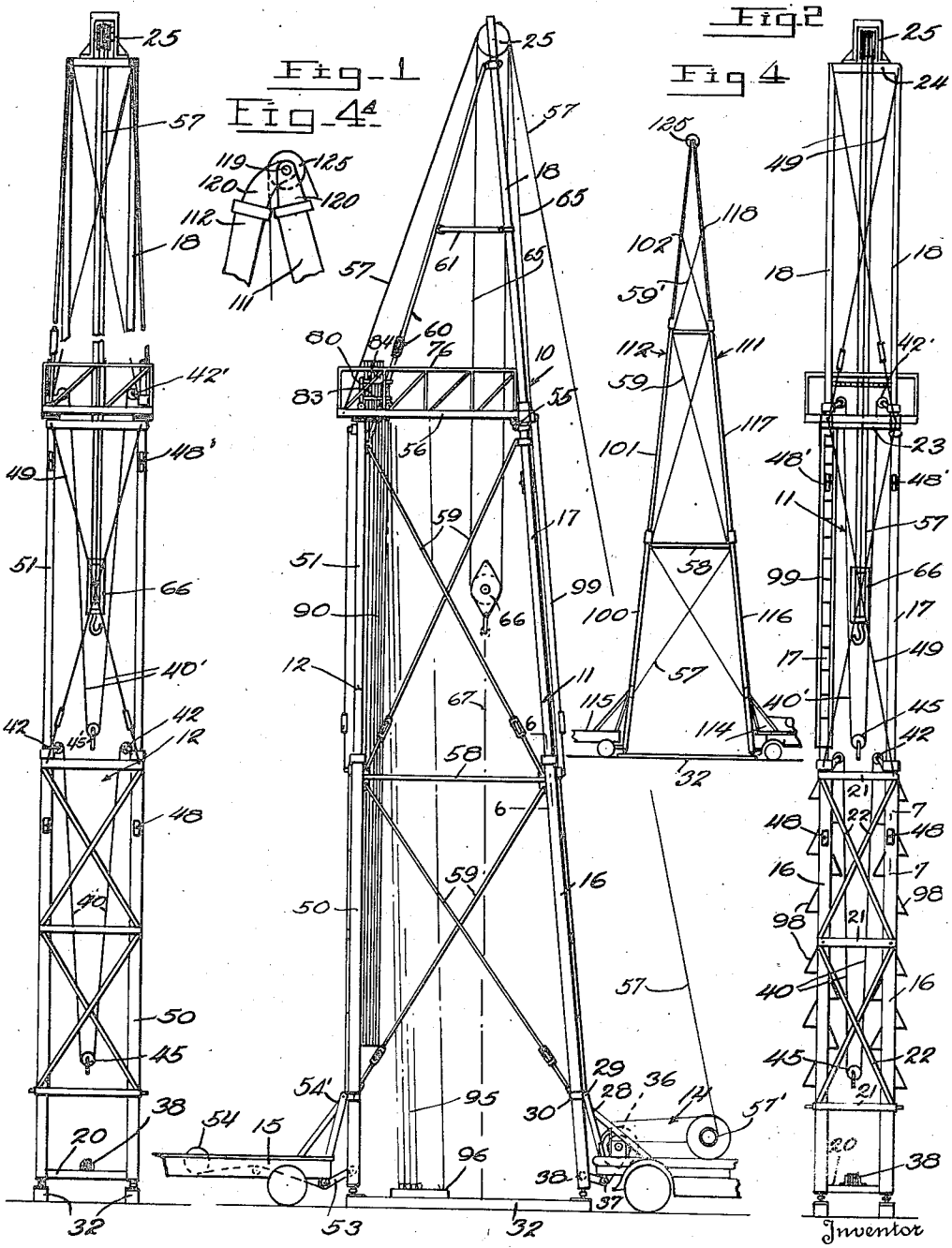


Fig. 1

Fig. 4A

Fig. 2

Fig. 4

Fig. 3

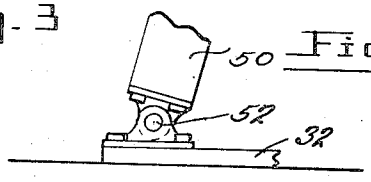


Fig. 5

Inventor

John Hart Wilson

By Watson, Cole, Grindle & Watson

Attorneys

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MAST POLE DERRICK

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Fig. 6

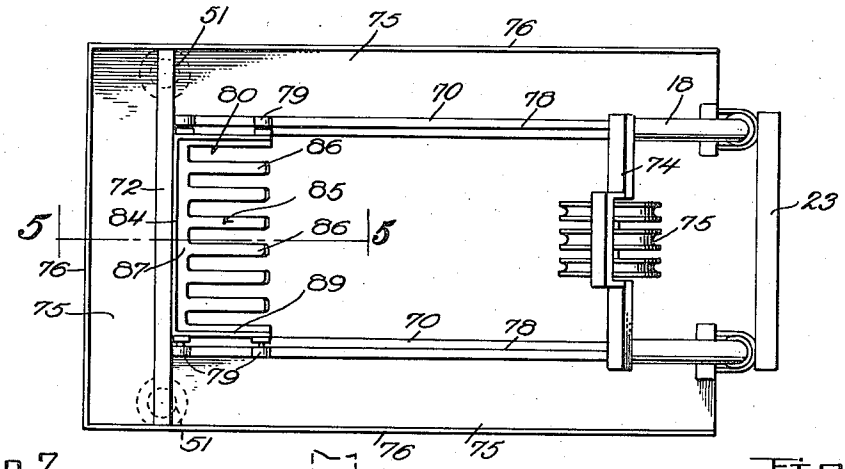


Fig. 7

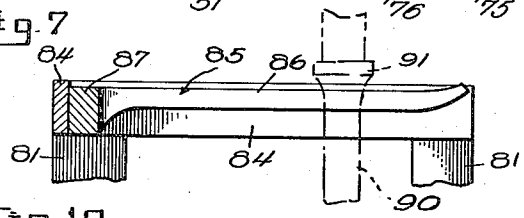


Fig. 8

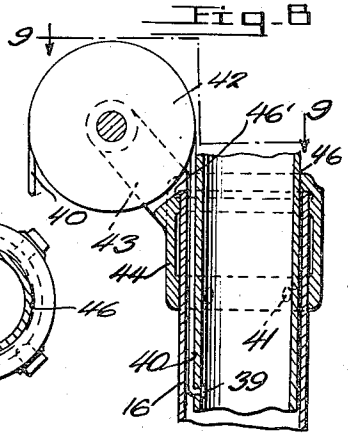


Fig. 10

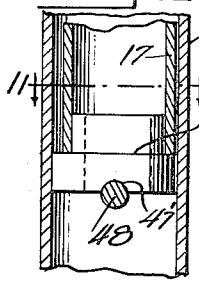
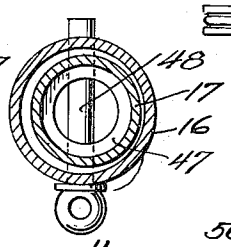


Fig. 11



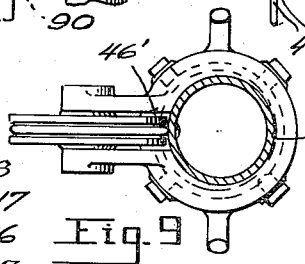


Fig. 9

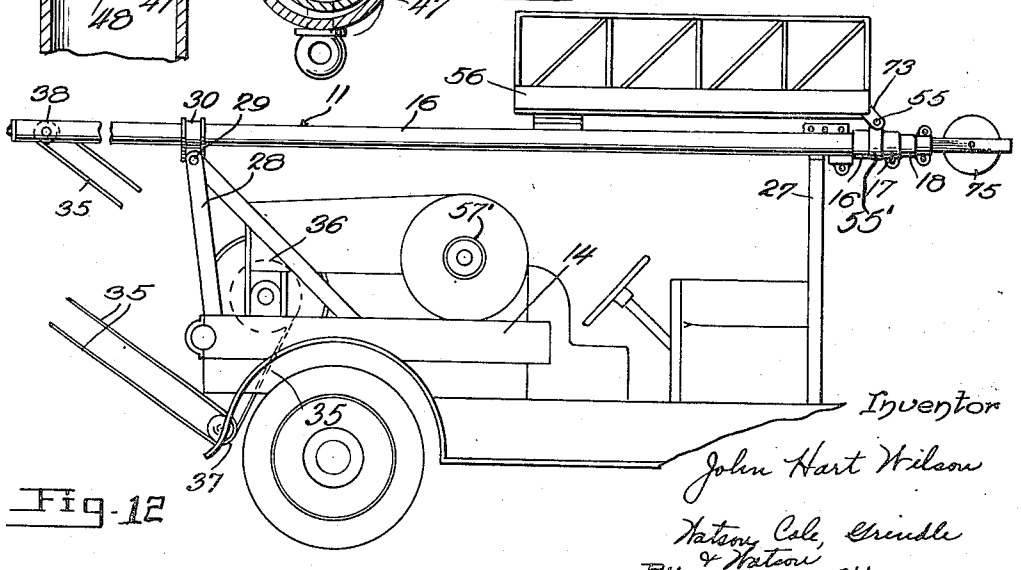


Fig. 12

Inventor
John Hart Wilson
Watson, Cole, Grindle & Watson
By
Attorneys

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MAST POLE DERRICK

John Hart Wilson, Wichita Falls, Tex.

Application January 16, 1940, Serial No. 314,164

10 Claims. (Cl. 254—139.1)

This invention relates to derricks and more particularly to a mast pole derrick especially adapted for use in the oil fields in connection with cleaning out wells and pulling rods and tubing.

The general object of the invention is the provision of a mast pole derrick of this type which may be readily transported and erected, but which is at the samae time very sturdy and of relatively great height when set up for operation.

Derricks of the described portable type need not be as high as drilling derricks, but they should be of sufficient strength to enable the pulling of even the deeper wells, and they should also have sufficient height so that the rods and tubing can be pulled in what is known as "doubles," that is, two sections at a time. The most common length of rods and tubing being about thirty feet, the total height of the derrick should be approximately eighty-five feet to be effective for the stated purpose. The difficulties attending the provision of a derrick of these specifications which would also be easily portable have been heretofore considered insurmountable.

In its preferred embodiment, the invention contemplates the provision of a derrick comprising two mast pole units, each adapted to be carried to and from the well at which they are used by means of separate trucks. Each unit consists of a plurality of telescoping sections, one of the units being somewhat longer than the other when extended. The longer unit is provided with the well pulling tackle,—cables, sheaves, etc.,—and also a hinged platform which carries a wheeled dolly for supporting and stowing the rod sections as they are pulled from the well. This unit is carried by the larger main truck which also comprises a portable winch having drums for the operating cables as well as the lines used in tilting the longer mast pole unit and platform and extending the sections.

The shorter unit is adapted to be transported and erected by means of an auxilitry truck which is merely provided with a loading winch and may be disconnected and used for other purposes after the secondary mast pole unit is erected and joined to the longer primary unit to complete the derrick structure.

In erecting the derrick, the telescoping sections of the two mast pole units are pulled out and blocked against retraction, and the units are secured together in spaced relation by means of various girts and diagonal braces. The hinged platform which has been swung outwardly from the main unit is disposed with its outer end resting upon the top of the auxiliary pole, and the rod carrying dolly is moved into position on the platform for receiving the rods as they are pulled from the well. After the rods are pulled and hung upon a rack provided on the dolly, the latter is rolled aside and the tubing is then pulled and racked.

After the operations at a given well are completed, the derrick is dismantled and collapsed upon the trucks with equal facility and transported to a new location.

In an alternative form of the invention, the two mast pole units may be of equal height, and in either embodiment certain of the poles, if desired, may be hinged to a stationary base instead of a portable one.

More specific objects of the invention include the provision of the traveling rod supporting dolly on the collapsible platform, means for extending and connecting the mast pole units, and other features which will become apparent from the following specification when read in connection with the accompanying drawings in which one embodiment of the invention is illustrated by way of example.

In the drawings,

Figure 1 is a view in side elevation of a derrick constituted and erected in accordance with the present invention;

Figure 2 is a front view of the main mast pole of the derrick;

Figure 3 is a rear view of the derrick, portions of the front mast pole being omitted for the sake of clearness of illustration;

Figure 4 is a very diagrammatic view in side elevation on a reduced scale of another embodiment of the invention;

Fig. 4A is an enlarged fragmentary view in elevation of the upper end of the derrick of Fig. 4.

Figure 5 is a fragmentary elevational view of a modified connection at the base of one of the mast pole units;

Figure 6 is a plan view of the upper end of the derrick showing the operating platform and dolly;

Figure 7 is a detail view in vertical section of the rack for supporting the rods upon the dolly, taken substantially on line 5—5 of Figure 6;

Figure 8 is a vertical sectional view taken through one of the legs of one of the mast pole units substantially as on line 6—6 of Figure 1;

Figure 9 is a view in horizontal section taken on line 9—9 of Figure 8;

Figure 10 is a view similar to Figure 8 but taken substantially on line 7—7 of Figure 2;

Figure 11 is a horizontal section taken on line 11—11 of Figure 10; and

Figure 12 is a fragmentary, somewhat diagrammatic view in side elevation of the main pole carrying truck, with the pole and platform collapsed and folded upon the same for transportation.

The derrick in its preferred form is indicated in its entirety by the reference numeral 10 in Figures 1, 2, and 3 of the drawings. The showing is somewhat diagrammatic, but the more important details of construction are clearly shown in other figures of the drawings. The derrick comprises essentially the two extensible mast pole units 11 and 12 which are adapted to be carried by the winch truck 14 and the auxiliary truck 15 respectively.

The main mast pole unit 11 comprises two parallel legs, each of which consists of a plurality of telescoping sections. Each of these sections comprise a tubular member, the members 16 being the largest and adapted to receive the intermediate sections 17, which in turn are adapted to receive the smallest uppermost sections 18. The lower sections 16 are rigidly connected by means of a bottom sill member 20 and a plurality of cross connecting members 21, as well as the diagonal struts 22, so as to form a rigid unit. The upper ends of the pair of intermediate members 17 are connected by the transverse member 23 and the uppermost units 18 are connected at their upper ends by the crosspiece 24, upon which is mounted the multiple sheave 25, about portions of which the main pulling cables may run. When collapsed, the sections 17 and 18 are received within the lowermost sections 16, and these sections lie substantially horizontally upon the main winch truck 14, as clearly shown in Figure 12 of the drawings. A bracket 27 supports the forward or upper end of the collapsed end of the unit 11, and the unit is pivotally supported near its lower end upon the supporting arms 28 by means of pivot pins 29 carried by the sleeves 30 secured to each leg of the unit. It may be incidentally remarked that in order to provide an eighty-five foot derrick, the overall length of the collapsed mast pole on the truck need be less than forty feet.

Upon arrival at the point of operations, such as an oil well which is to be pulled, the truck 14 is disposed adjacent the sills or framing 32, and the collapsed main mast pole unit 11 is raised about the pivot 29 so that the lower end thereof rests firmly upon one corner of the sill framing 32. In order to raise the mast pole unit, a line 35 from the drum 36, which is the main winding drum, is passed over the multiple sheave 37 secured upon a lower portion of the truck and around the multiple sheave 38 secured upon the sill member 20 of the mast pole unit. The end of the line is fastened either to the truck body or the pole and arranged to provide a multiple line pull. By referring to Figures 1 and 12 of the drawings, it will be clearly understood how the line 35 serves to draw the lower end of the mast pole downwardly and raise the main portion up to the position shown in Figure 1.

Then, when the retracted unit 11 is raised to a substantially vertical position, the combined intermediate and upper sections 17 and 18 are extended from the enclosing lower sections 16 by the following means which are clearly shown in Figures 8 and 9. Secured to both of the tubular sections 17 of the mast pole unit at the points 39 adjacent the lower ends thereof, are the ends of a line 40 which passes upwardly around the small pulleys or sheaves 42 secured in brackets 43 formed on the collars 44 at the upper ends of the sections 16. These collars are secured to the ends of the sections 16 as by means of the fastening elements 41 disposed at intervals about the collar. An inwardly directed flange 46 is formed at the top of the collar and provides a shoulder which overlies the upper end of the section 16 and prevents downward movement of the collar thereon. The inner peripheral margin of the flange 46 is circular, but eccentric with respect to the main portion of the collar and the unit 16, and is adapted to embrace the tubular telescoping section 17, which is thus held away from the wall of section 16 at one side to accommodate the cable or line 40. A slot 46' is formed in the flange 46, just beneath the pulley or sheave 42, through which the line 40 may pass into the section 16. The bight of the line 40 carries the block 45 and a line from the drum on the winch truck may be passed around one of the sections of the pulley 38 and secured to the block 45. Upon winding in this line, the intermediate sections 17 carrying the upper sections 18 of the unit are drawn upwardly out of the base sections 16. When the lower ends of the sections 17, which are provided with the eccentric stepped shoes 47, are drawn upwardly beyond the location of the blocking pins 48, the pins are inserted through the aligned openings in the section 16 and beneath the notches 47' in the shoe, and serve to effectively lock the extended intermediate section in its raised position. This is clearly shown in Figures 10 and 11 of the drawings.

A similar arrangement is employed for projecting the upper sections 18 from the intermediate sections 17, a line 40' being provided with a block 45' to which a line from the winch may be secured, and the upper ends of the intermediate sections 17 being provided with sheaves 42' around which the ends of the line 40' are passed to be secured to the upper members 18 just as in the case of the intermediate sections 17. Stop pins 48' are employed to block the descent of the upper members 18 when they are extended. After the main or forward mast pole unit 11 has been extended to the position shown in Figures 1 and 2 of the drawings and blocked against retraction, the upper portions of the structure may be further braced by means of the diagonal turnbuckle rods 49.

The auxiliary truck 16 which carries the rear mast pole 12 is then backed up to the other edge of the framing 32 and the retracted unit, consisting of the lower tubular sections 50 and the upper sections 51, are raised to substantially vertical position by a similar system of lines and sheaves indicated generally at 53 and including a small loading winch of conventional type indicated diagrammatically at 54. The two sections of this rear unit are then extended in exactly the same manner as described in connection with the corresponding sections of the forward unit 11, and the same reference numerals are employed in designating the braces and tackle employed in erecting the two units. The pivotal connections 54' are preferably made readily detachable and the lines 53 may be detached from the truck 15 and suitably secured, so that the auxiliary truck may be driven away and used for other purposes, as already described.

Alternatively, the lower section 50 of the rear unit 12 may be pivoted or hinged to the platform 32 by means of the hinge or pintle means 52.

Then, in erecting this unit, it may be swung erect by suitable tackle, while telescoped and then extended when in the proper vertical position in the same way as described in connection with the first embodiment.

Pivotally secured to collars 55' carried by the upper ends of members 17 of the forward unit 11 as at 55 is the operating platform 56. This platform is adapted to fold against the collapsed unit 11 and take the position shown in Figure 12 of the drawings during transportation of the equipment. When the forward mast pole unit 11 is erected and extended, however, the platform 56 is raised to a horizontal position as by means of the catline 57 which is preferably trained about a cathead 57' driven from the power plant on the winch truck 14. The outward end of the platform rests upon the top of the upper section 51 of the rear mast pole unit 12. This platform is of a very sturdy construction and is securely attached to the derrick.

When the two units are erected, they are interconnected and braced by means of the girts 58 and the diagonal braces 59. The upper portions of the derrick are also braced and strengthened by means of the braces 60 connecting the upper portions of the sections 18 and 51 and the cross-brace 61 attached thereto. The bracing elements, if desired, may be kept secured to the main pole 11, and raised and lowered therewith, and extended and connected to the auxiliary unit 12 after the units are raised.

The predetermined slight inclination of the forward mast pole unit 11 is such that the upper operating sheave 25 is above the center line of the well and the cable 65 carrying the block 66 is trained about the sheave 25 and about the main winding drum 36 carried by the main truck 14 in the usual way. A cable 67 is suspended from the hook of the block 66 and is adapted to be secured to the rods and tubing to be pulled from the well.

The platform 56 comprises two parallel beams 70 connected adjacent their rear ends by the cross-beam 72, the ends of which rest upon the upper ends of the members 51 of the rear mast pole unit 12. The forward ends of the beams 70 are provided wtih the brackets 73 which provide the pivots 55 for the platform. Narrow walks 75 are provided on three sides of the platform, and these are surrounded by the railings 76. Upon the beams 70 are laid a pair of rails 78 upon which the wheels 79 of the rod carrying dolly 80 are adapted to run. This dolly consists of a hollow frame open upon one side, having vertical elements 81 at its four corners and having U-shaped horizontal members 83 and 84 at its lower and upper ends respectively. Rigidly secured within the upper U-shaped frame 84 of the dolly is the rod rack 85 consisting of a substantially U-shaped member having a series of fingers 86 extending from the rear portion 87 thereof. During pulling of the rods, the dolly will occupy a position adjacent the forward end of the platform, and when the rods are successively pulled in double sections, these double sections are uncoupled from the well and suspended by their upper ends between the fingers 86 of the dolly rack. One such rod is indicated diagrammatically in Figure 7 of the drawings at 90, the coupling 91 at the upper end thereof serving to support the same from the rack. When the rods are all withdrawn and the dolly rack is full, the dolly is rolled rearwardly to the position shown in Figures 1 and 6 of the drawings and the double rod sections 90 occupy the positions shown in Figure 1.

With the rod sections safely stowed out of the way, the well tubing 95 is now pulled and racked in double sections as shown in Figure 1. The lower ends of the tubing may rest upon the block or platform 96 and the upper ends may lean against the beams 70 of the platform 56 or racked in any suitable manner.

In order to provide a ready access to the operating platform 56, the steps or rungs 98 may be provided on the lower sections 16 and 50 of the mast pole units and the ladders 99 secured to the intermediate sections 17 and 51.

Obviously the derrick may be dismantled, retracted, and collapsed for transportation by reversing the operations previously described, first removing the braces and struts, then retracting the telescoping sections, and lowering the bottom sections into position on the respective trucks 14 and 15.

In Figure 4 there is diagrammatically shown an embodiment of the invention in which the rear or auxiliary unit 112 is comprised of three sections 100, 101, and 102, which correspond to the sections 116, 117, and 118 of the main unit 111, making the two mast pole units of equal height. The two units are connected at the top as by means of the transverse shaft 119 passing through the ears 120 at the top of each unit 111 and 112, respectively. A multiple sheave 125 is rotatably mounted upon the transverse shaft and is designed to serve the same purposes as the sheave 25 of the embodiment previously described. The units are adapted to be respectively transported by the trucks 114 and 115 and are set on the same base 32 and connected by similar braces and girts 57, 58, 59, and 59', all as diagrammatically shown in Figure 4.

It will thus be seen that by means of the present invention there has been provided a well pulling derrick which is well adapted for the particular purpose described, but which may obviously be employed either with or without modification for various other purposes which may occur to one skilled in the art.

Changes and modifications may be made in the illustrated embodiment without departing from the scope of the invention as defined by the following claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a derrick of the class described, in combination, a pair of extensible mast pole units which are independently portable, means for independently extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith.

2. In a derrick of the class described, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, one of said units being longer than the other and carrying a sheave at the top thereof,

and tackle associated with said sheave for pulling a well or the like.

3. In a derrick of the class described, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, one of said units being longer than the other and carrying a sheave at the top thereof, and tackle associated with said sheave for pulling a well or the like, certain of the interconnecting and bracing means being relatively permanently attached to one of said units and adapted to be transported therewith.

4. In a derrick of the class described, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, one of said units being longer than the other and carrying a sheave at the top thereof, tackle associated with said sheave for pulling a well or the like, a platform pivoted to the longer mast pole unit and supported at its outer end upon the top of the other unit.

5. In a derrick of the class described, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, one of said units being longer than the other by the length of a section and carrying a sheave at the top thereof, tackle associated with said sheave for pulling a well or the like, a platform pivoted to the top of an intermediate section of the longer mast pole unit and supported at its outer end upon the top of the uppermost section of the other unit.

6. A porable derrick outfit for pulling wells or like purposes, comprising, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel rigidly connected tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, a pair of wheeled vehicles, means for respectively pivoting the lowermost sections of said units to said vehicles whereby the retracted units may be swung to a substantially horizontal position thereon, and hoisting means on each of said vehicles for erecting said units.

7. A portable derrick outfit for pulling wells or like purposes, comprising, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, a platform pivoted to one of said units, a pair of wheeled vehicles, means for respectively pivoting the lowermost sections of said units to said vehicles whereby the retracted units may be swung to a substantially horizontal position thereon, hoisting means on each of said vehicles for swinging said units to vertical positions and extending the telescoping sections, and hoisting means on one of the vehicles for swinging said platform into operative position.

8. A portable derrick outfit for pulling wells or like purposes, comprising, in combination, a pair of extensible mast pole units which are independently portable, both of said units being of the same length, means for extending and retracting said units, and means for connecting said units at the tops and means for bracing them in upwardly convergent positions, each of said units comprising a pair of parallel rigidly connected tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, a pair of wheeled vehicles, means for respectively pivoting the lowermost sections of said units to said vehicles whereby the retracted units may be swung to a substantially horizontal position thereon, and hoisting means on each of said vehicles for erecting said units.

9. A portable derrick outfit for pulling wells or like purposes, comprising, in combination, a pair of extensible mast pole units which are independently portable, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith, one of said units being longer than the other and carrying a sheave at the top thereof, tackle associated with said sheave for pulling a well or the like, a platform pivoted to the longer mast pole unit, a pair of wheeled vehicles, means for respectively pivoting the lowermost sections of said units to said vehicles whereby the retracted units may be swung to a substantially horizontal position thereon, hoisting means on each of said vehicles for swinging said units to vertical positions and extending the telescoping sections, hoisting means on the vehicle, which is adapted to carry the longer unit, for swinging said platform into operative position, a main winding drum on said last named vehicle for operating the well pulling tackle, and a detachable connection between said other vehicle and the shorter unit, whereby said vehicle may be disconnected and otherwise employed while the pulling operations are effected by the winding means on the main vehicle.

10. In a derrick of the class described, in combination, a base, a pair of extensible mast pole units are independently portable, means for pivoting one of said units to said base, means for pivotally mounting the other of said units upon a wheeled vehicle, means for extending and retracting said units, and means for connecting and bracing them in upwardly extending, spaced apart positions, each of said units comprising a pair of parallel, rigidly connected, tubular sections and one or more other pairs of parallel connected tubular sections telescoping therewith.

JOHN HART WILSON.